UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/544,822	04/06/2000	Tongbi Jiang	4241US	9308

7590 12/22/2008

James R Duzan
Trask Britt & Rossa
P O Box 2550
Salt Lake City, UT 84110

EXAMINER	
GRAYBILL, DAVID E	

ART UNIT	PAPER NUMBER
2894	

MAIL DATE	DELIVERY MODE
12/22/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TONGBI JIANG

Appeal 2008-4735
Application 09/544,822
Technology Center 2800

Decided: December 22, 2008

Before KENNETH W. HAIRSTON, JOHN A. JEFFERY, and CARLA M. KRIVAK, *Administrative Patent Judges*.

KRIVAK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134 from a final rejection of claims 1-5, 7-32, and 58-64.[1] We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

---

[1] Claim 6 has been cancelled and claims 33-57 have been withdrawn from consideration.

STATEMENT OF CASE

Appellant's claimed invention is an underfill method for filling the gap between a bumped or raised semiconductor die or semiconductor device and a substrate (Spec. 2:5-9). The method includes applying a liquid wetting agent layer to the surface of the substrate and/or semiconductor device, attaching the substrate and semiconductor device, and applying a flowable underfill material between the substrate and semiconductor device such that it contacts the wetting agent layer.

Independent claim 58, reproduced below, is representative of the subject matter on appeal.

> 58. A method for attaching a semiconductor assembly, said method comprising:
>
> providing a semiconductor device having an active surface; providing a substrate having an upper surface;
>
> applying a liquid wetting agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate;
>
> connecting said semiconductor device to said substrate so that said active surface of said semiconductor device faces said upper surface of said substrate; and
>
> applying a flowable underfill material between the substrate and the semiconductor device, such that said flowable underfill material contacts said applied wetting agent layer.

REFERENCES

Plueddemann	US 4,231,910	Nov. 4, 1980
Pluddemann	US 4,961,967	Oct. 9, 1990
Banerji	US 5,203,076	Apr. 20, 1993
Akram	US 5,766,982	June 16, 1998
Yamada	US 5,959,363	Sep. 28, 1999

Hieda	US 6,303,277 B1	Oct. 16, 2001 (filed Aug. 31, 1999)
Schultz	US 6,350,840 B1	Feb. 26, 2002 (filed Jun. 18, 1999)

The Examiner rejected claims 58-61 under 35 U.S.C. § 102(e) based upon the teachings of Yamada.

The Examiner rejected claims 1-5, 7-12, 15, 22, 62, 63, and 64 under 35 U.S.C. § 103(a) based upon the teachings of Yamada, Schultz, and Pluddemann '967.

The Examiner alternatively rejected claim 64 under 35 U.S.C. § 103(a) based upon the teachings of Yamada, Schultz, Pluddemann '967, and Hieda.

The Examiner rejected claims 13, 14, 16-21, and 23-30 under 35 U.S.C. § 103(a) based upon the teachings of Yamada, Schultz, Pluddemann '967, and Akram.

The Examiner rejected claims 31 and 32 under 35 U.S.C. § 103(a) based upon the teachings of Yamada, Schultz, Pluddemann '967, and Banerji.

Appellant contends Yamada does not anticipate claim 58 because it does not teach "applying a liquid wetting agent layer to one of … semiconductor device and…substrate" (App. Br. 14; Reply Br. 2).

ISSUES

Did the Examiner err in finding the resin layer of Yamada anticipates the liquid wetting agent layer of Appellant's claimed invention under 35 U.S.C. § 102 (e)?

Did the Examiner err in finding the claims 1-5, 7-32, and 62-64 obvious over various combinations of Yamada, Schultz, Pluddemann '967, Hieda, Akram, and Banerji?

FINDINGS OF FACT

1. Appellant's method applies a liquid wetting agent layer to a surface of a semiconductor device, a surface of a substrate, or both. The semiconductor surface and substrate surface are connected to each other. A flowable underfill material is applied between the substrate and the semiconductor device such that it contacts the applied wetting agent layer (Spec. 5:1-9; cls. 1, 10, 58, 62, 64).

2. The liquid wetting agent layer is a silane layer 2 that can be silane based (Spec. 5:10-11; Spec. 9:25-26; Spec 10:8-10; cls. 3, 61, 62). The silane layer 2 increases the surface tension on the surface where it is applied allowing the underfill material to fill the gap between the semiconductor and the substrate via capillary action forces in a lesser length of time (Spec. 5:13-16). The silane layer can be any silane base material such as glycidoxypropyltrimethoxysilane and ethyltrimethoxysilane (Spec. 5:16-17; Spec 10: 8-10) as long as it promotes a sufficient wetting effect (Spec. 10:13).

3. Yamada teaches a semiconductor device having an improved encapsulating resin. A first resin 204 encapsulates a wiring circuit board and a second resin 205 encapsulates the surface of the semiconductor device. A third resin 206 is then dispensed between the first and second resins (col. 56, ll. 14-23; col. 57; ll. 15-20; Figs 56A-D).

4. The first and second resins include 3 parts by weight of a silane coupling agent (col. 56, ll. 29-39).

5. A wetting agent is defined as "a natural or synthetic compound which reduces the surface tension of water or another liquid (see Surface active substances)."[2] .

6. Wettability *(chemistry)* is defined as "the ability of any solid surface to be wetted when in contact with a liquid; that is, the surface tension of the liquid is reduced so that the liquid spreads over the surface." McGraw-Hill Dictionary of Scientific and Technical Terms, McGraw-Hill Companies, Inc., *available at* http://www.answers.com/topic/wettability.

PRINCIPLES OF LAW

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros., Inc. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir.), *cert. denied*, 484 U.S. 827 (1987). The inquiry as to whether a reference anticipates a claim must focus on what subject matter is encompassed by the claim and what subject matter is described by the reference. As set forth by the court in *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 772 (Fed. Cir. 1983), it is only necessary for the claims to "'read on' something disclosed in the reference, i.e., all limitations of the claim are found in the reference, or 'fully met' by it."

---

[2] CONCISE ENCYCLOPEDIA CHEMISTRY, Mary Eagleson, 1994, *available at* http://books.google.com/books?id=Owuv-c9L_IMC&pg=PA1173&lpg=PA1173&dq=liquid+wetting+agent+semiconductors&source=web&ots=zVq1rdKf8&sig=liWBhxi4bS_R4bXtM7H3TG6a-Yo&hl=en&sa=X&oi=book_result&resnum=8&ct=result.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *See In re Fine*, 837 F.2d 1071, 1073 (Fed. Cir. 1988). In so doing, the Examiner must make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). "[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability." *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). If the Examiner's burden is met, the burden then shifts to the Appellants to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. *See In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992).

ANALYSIS

Anticipation

The Examiner rejected claims 58-61 under 35 U.S.C. § 102(e) over Yamada. The Examiner contends Yamada teaches all the features of these claims. Particularly, the Examiner states the resin encapsulation layer 205 corresponds to the liquid wetting agent layer of Appellant's claimed invention because this layer is "molten" when coated on the surface of the wiring board (Ans. 4).

Appellant asserts Yamada does not teach a liquid wetting agent layer as claimed, as it is not the polymer film 208 nor the second encapsulation resin 205 (Reply 3-4). Appellant asserts that the polymer film 208 is formed of wax (Reply Br. 3), and although it has "wettability" this is not the same as

a "liquid wetting agent." This argument is consistent with the ordinary and customary meaning of these terms (FF6; FF5).

Additionally, Appellant contends that Yamada's encapsulation layer 205 is formed of resin that includes "3 parts by weight of silane coupling agent" (col. 56, l. 35; Reply Br. 4). Thus, the "3 parts of silane of the 453.5 total parts of the material of the second encapsulation resin layer 205…is present as a coupling agent so that that the fused silica (mineral filler) and the resin can react to promote a stronger bond at the interface thereof" (Reply Br. 6). This is not the same as a silane layer or silane-based layer that forms the liquid wetting agent of Appellant's claimed invention (FF 2).

The Examiner contends layer 205, because it is "molten" corresponds to a liquid wetting agent (Ans. 4). However, as noted by Appellant, a wetting layer is a particular type of layer that, among other things, reduces surface tension of water or another liquid (FF5). The resin layer 205 of Yamada does not correspond to the liquid wetting layer for the reasons provided by Appellant (Reply Br. 6). Nor is there any evidence on the record before us that would establish that this is the case. Thus, Yamada does not anticipate claim 58.

Obviousness

The Examiner further rejected claims 1-5, 7-32, and 61-64 as obvious over various combinations of Yamada with Schultz, Pluddemann '967, Hieda, Akram, and Banerji under 35 U.S.C. § 103(a). Independent claims 1, 10, and 64, contain substantially the same limitations as those in claim 58. None of the remaining cited references cures Yamada of its deficiencies.

Claim 62, however, merely calls for a "silane-based" material. Appellant's specification states the silane layer is comprised of any silane

base material (FF2). The evidence before us indicates that a "silane-based" material layer would have silane as a base and would promote sufficient wettability (FF2). Yamada's epoxy resin layer including "3 parts by weight of silane coupling agent" (col. 56, l. 34) does not meet either of those requirements. First, the layer is an epoxy resin layer having a majority of resin and filler (col. 56. ll. 31-33) rather than silane. Second, the silane in the epoxy resin layer is merely acting as a coupling agent; it is not present for the purpose of promoting wettability. In fact, it discourages wettability as it acts as a coupling agent. Again, none of the remaining cited references cures Yamada of its deficiencies.

Thus, the Examiner has not provided a prima facie case of obviousness with respect to claims 1, 10, 62, and 64, and thus claims 2-5, 7-9, 11-32, 61, and 63, which depend therefrom, over Yamada in combination with Schultz, Pluddemann '967, Hieda, Akram, and Banerji.

CONCLUSION

The Examiner erred in rejecting claims 58-61 as anticipated by Yamada under 35 U.S.C. § 102(e).

The Examiner erred in rejecting claims 1-5, 7-32, and 61-64 as obvious under 35 U.S.C. § 103(a).

DECISION

The Examiner's decision in rejecting claims 1-5, 7-32, and 58-64 is reversed.

REVERSED

gvw

James R. Duzan
TRASK BRITT & ROSSA
P. O. BOX 2550
Salt Lake City, UT 84110